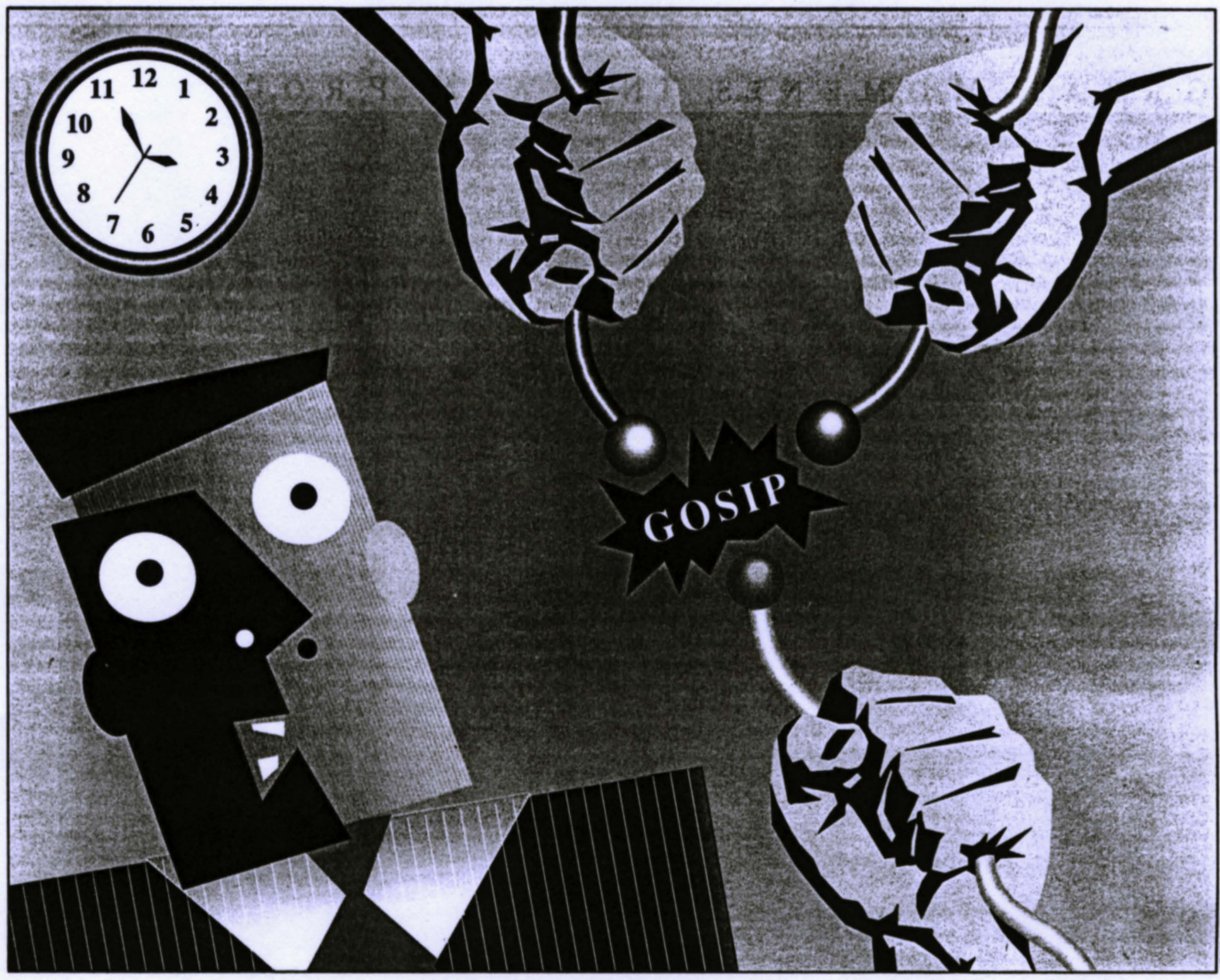
PERSPECTIVES

Where Systems Meet

A kind of networking esperanto, GOSIP was mandated by the government, but adoption will be gradual.



BY CARL MALAMUD

August 15 was the magic date for government procurement specialists: All future computer systems must be compatible with the new Government OSI Profile (GOSIP). The goal is to ensure that all government systems meet certain basic levels of interoperability and consistency. Will the new procurement standard bring instant communications ease? Will it replace the current TCP/IP standards?

Hardly. Experts predict that it will take as long as a decade of transition before OSI becomes so integrated in corporations and government agencies that it truly replaces the currently pervasive TCP/IP.

GOSIP is based on the Open Systems Interconnect (OSI) standards developed by the International Standards Organization. OSI standards are highly specific documents that detail how everything from LANs to security to network management will work.

OSI consists of seven layers of transport protocols — which, when adopted, should allow different computers to share data and messages. While many research facilities and government agencies currently use TCP/IP protocols, many expect OSI to catch on because it will support more users on a network.

GOSIP takes a core subset of OSI, enough to make a minimal network, and mandates them as a federal standard. Because GOSIP was classified as a Federal Information Processing Standard in August, new computer networks and significant upgrades to existing networks must include GOSIP support — or show good cause.

A single networking technology has potential for a host of benefits. Look at TCP/IP for example. The government has, for many years, required that TCP/IP be used in some government purchases of computers, particularly those for the military. The result is interoperability: Computers that share the same networking technology can share information.

Government standardization on a single technology also affects corporate buyers. When the functionality is established by standards, vendors begin competing on price. Because the government is such a large purchaser, vendors are eager to enter the marketplace. Commercial users can ride on the government's purchasing power to network their own systems.

WHAT IS GOSIP? OSI specifies seven levels of communications protocols. GOSIP, Version 1 specifies three levels of interoperability among computing systems:

- The subnetwork (which consists of the data link layer plus the physical link layer).
- The network.
- The application.

An example of a subnetwork is an Ethernet or token ring local area network. So why not just use the term LAN? In the OSI world, we can expect to see large numbers of wide-area connections.

A subnetwork is any technology that allows two nodes connected to it to exchange information. Ethernet is a simple example: Any computer connected to the coaxial (or twisted pair) cable can broadcast data to any other node on that cable.

GOSIP allows three types of LAN technologies to be used. (See Figure 1: Protocol stack.) Token ring, token bus, and CSMA/CD (known as Ethernet) are all standards that were developed by the IEEE and subsequently adopted by the International Standardization Organization.

All three technologies use an interface known as the Logical Link Control.

For wide-area communications, GOSIP adopts X.25, such as Tymnet and Telenet, or the national networks offered in Europe.

To comply with GOSIP at the subnetwork level, a vendor must offer one of these four subnetwork technologies: token ring, token bus, CSMA/CD, or X.25. Note that there is no requirement to offer all the technologies.

THE PROTOCOL STACK. Built on top of the subnetwork technologies is the OSI protocol stack. The network, transport, session, and presentation layer all add value to the lower layers. The combination of services is then used by network applications, such as the messaging service.

The network layer combines different subnetworking technologies together into a coherent internetwork. A packet of data may be forwarded over several different subnetworks until it reaches its destination. As long as the packet is in an OSI-compliant format, the destination node will be able to read it.

One of the key components of the OSI standards is a common addressing format. Eventually, if the OSI visionaries get their way, every computer in the world will be reachable using the OSI network layer. By setting up a standard addressing format, we can ensure that all addresses are unique. For the federal government, the National Institute of Standards and Technology, the developer of GOSIP, will also handle address administration.

While an address specifies a unique location, the network also needs a way to determine how to route a packet of data to that address. In the current version of the OSI documentation, each router (known as an intermediate system) must be told the location of reachable addresses. This is known as static routing.

The network layer delivers packets of information from one computer to others through an internetwork. The service of the network layer is a best-effort delivery: Packets can get lost, duplicated, or mangled in the network.

Within the transport layer, Transport Protocol 4 (TP4) guarantees that all packets between two users are delivered error free in the order in which they are sent. In addition, TP4 (similar to the transport control protocol in the TCP/IP world), ensures that two programs on two different computers can exchange streams of data.

Finally, GOSIP specifies protocols to

How to Find Out More About GOSIP

Here is one way to get more information about OSI and GOSIP. The *GOSIP User's Guide* is an easy-to-read introduction to OSI and GOSIP designed for federal employees who will have to comply with the regulations. It can be obtained from:

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4650.

Phone orders are accepted with credit cards. The cost is $23 for regular shipping. Specify Order No. PB90-111212.

be used at the session, presentation, and application layers of the network. The session layer starts (as the name implies) a session between two programs. The presentation layer is a common format for the exchange of data between different systems. The application layer pulls this all together, allowing a program to form an association with another by simply giving the name of the target program (known as an Application Entity Title or AE-Title).

THE APPLICATION LAYER. The protocol stack builds the foundation that allows two programs to communicate. At this point, the network is all infrastructure and no useful services for the user. GOSIP initially specifies two services to be provided: X.400 message handling and the File Transfer, Access, and Management (FTAM) service for access to data.

X.400 is a widely accepted standard for electronic mail and other message handling tasks. By using X.400, the government hopes to be able to exchange messages among all government agencies, as well as to commercial providers.

FTAM is a fairly sophisticated protocol for access to remote files. "FTAM is a huge, complex specification. It gives you a hernia to carry the documents around," said John McConnell of Interworking Inc., in Boulder, Colorado.

Rather than specifying all of the FTAM capabilities, GOSIP only requires a limited subset. To be GOSIP compliant, a vendor needs only to provide a simple bulk-transfer capability. Optional capabilities include access to file attributes (such as security or accounting information about the file) or to pieces of files (as in the case of searching an indexed file by a value).

THE LONG-TERM STRATEGY. Basic GOSIP is really just two services: file transfer and messaging. The services are provided on four different subnetworks: X.25, token ring, token bus, and Ethernet.

That's not the end of the story, however. GOSIP will be updated every 18 months or so to add new requirements and capabilities. Version 2 is already in the works, and will include things such as the X.500 directory service and the OSI Virtual Terminal protocols.

"Version 1 lays the basic foundation. Version 2 will expand on that basic foundation," said Jerry Mulvenna of the National Institute of Standards and Technology [NIST] and one of the authors of GOSIP. "The GOSIP Advanced Requirements Group determines what the government's needs are. NIST then monitors what products vendors have available. If technology becomes available, GOSIP mandates that agencies use OSI standards when they meet their needs."

The moving target aspect of GOSIP is key: It says that NIST will take an active role in selecting international standards and requiring that they be used in government procurements. Needless to say, there will be computing environments where this doesn't make sense. A need for specific technologies and cost-savings goals may serve as just cause for not buying GOSIP-compliant products.

GOSIP CONFORMANCE. A popular misconception about the GOSIP standard is that it applies to all computers. In fact, GOSIP standards apply to the communication between groups of computers: internetworking.

To be GOSIP compliant, a vendor simply needs to support a single point of

Dynamic Routing

One of the big elements missing from GOSIP is a specification for dynamic routing, which allows an internetwork router to inform other routers about the presence of new networks or new systems on networks.

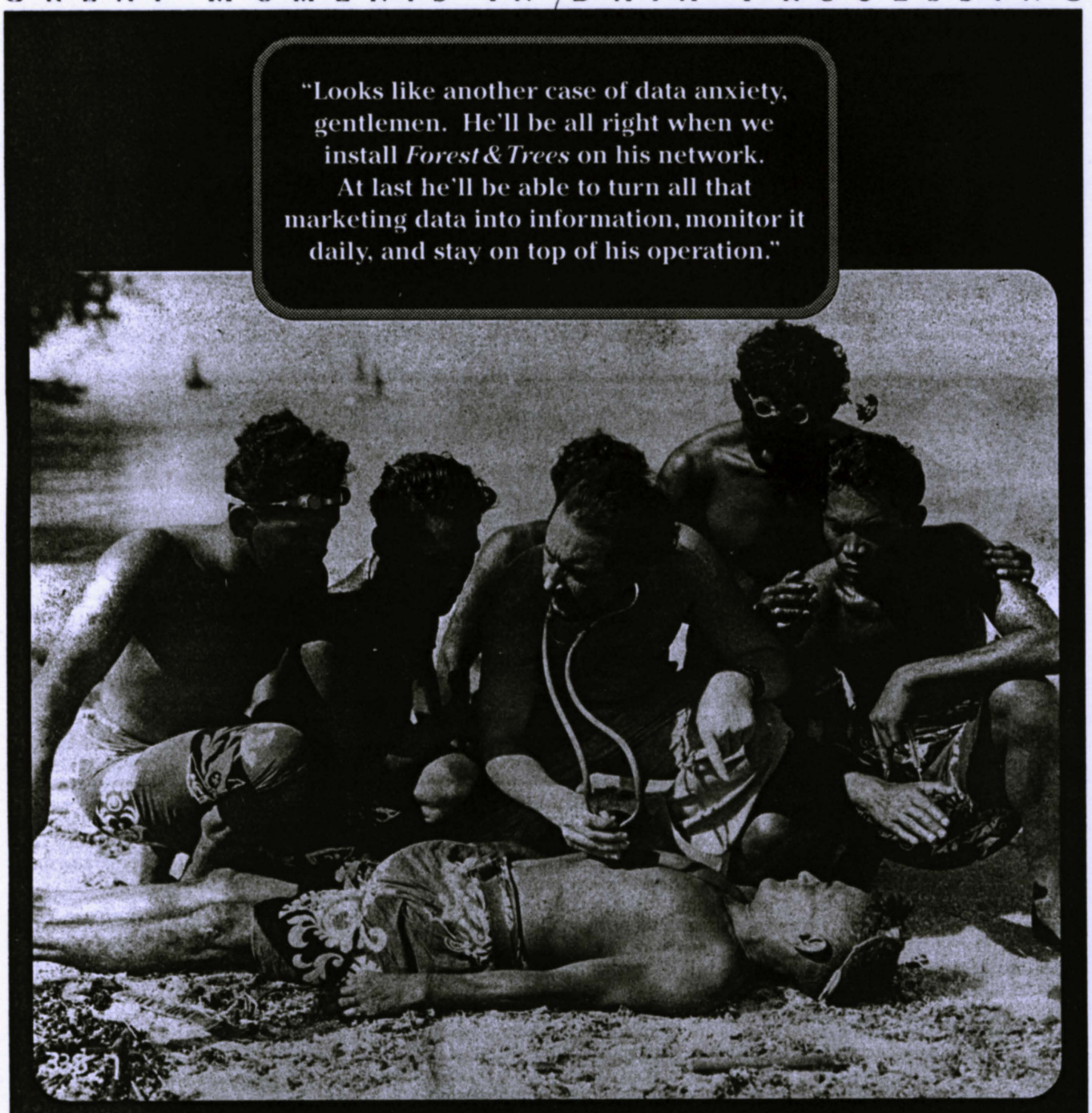
Because dynamic routing does not require manual intervention — which static routing does — it is much more responsive to changes in the topology of the network. If there are multiple paths between two computers, a dynamic routing algorithm will decide which path is best. It will also switch over to less desirable paths in the case of a network outage.

Another name for a dynamic routing algorithm is an IS-IS protocol, through which routing information is exchanged between intermediate systems. End systems simply hand off their packet to the nearest router. The router needs to know how to find the destination node, using either dynamic or static routing tables.

The reason that GOSIP doesn't include dynamic routing is simple: The OSI committees have yet to decide on a dynamic routing algorithm. Digital Equipment Corp. has proposed an algorithm that it uses in its soon-to-be-released Phase V, known as DECNet/OSI. The technical committees are working furiously to turn the DEC proposal into a draft standard acceptable to other vendors, but even if everybody agrees with DEC, it will still take a long time before OSI has an accepted international standard in this area.

Lack of dynamic routing is no problem for simple networks of just one type of system. But in a complex topology the issue is crucial. Until OSI and GOSIP can deal with the issue, TCP/IP will still hold the edge for the large complex networks.

GREAT MOMENTS IN DATA PROCESSING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interconnection. For example, a vendor can continue to sell computers based on the proprietary Arcnet subnetwork and using some proprietary network such as Novell's Netware. To be GOSIP compliant, the vendor could provide a gateway — a single computer that translates incoming FTAM requests to a proprietary file protocol and incoming X.400 messages to a proprietary messaging format.

Most vendors plan to keep their own proprietary protocols, and add GOSIP as a second set. "OSI will become every agency's second language, maybe their first," said Richard des Jardins, vice president of Interop Inc. and one of the original OSI architects. "Just like English is everybody's second language, maybe their first."

Companies with the biggest investment in proprietary protocols, such as Digital Equipment Corp. and IBM, have been quick to emphasize that they will support OSI. DEC has even gone so far as to change the name of its products from DEC-Net to DEC-Net/OSI.

The name change doesn't mean that DEC is abandoning its own protocols. It only means that two protocol stacks are offered: OSI for communication to the outside world and DEC-Net for internal communications. DEC paints this strategy as "value-added" or staying ahead of the standards process.

OSI is "not a second language," said Steve Kelly, a DEC marketing manager. "A good analogy is with automobiles. Every year you have standard options and value-added options. What was value added becomes standard."

DEC believes its protocols work in an area that the standards have not yet covered. While this is true in some instances, such as DEC's Distributed Name Server, DEC appears to be duplicating the international standards in others. For example, DEC is heavily dependent on Data Access Protocols, instead of FTAM.

One of the purposes of GOSIP is to encourage OSI use in situations where standards are available. "If you have a need for a service for which there is an international standard, you should acquire implementations based on that standard, not implementations that will continue to lock you into one vendor," said NIST's Mulvenna.

GOSIP ACCEPTANCE. Many consultants and users are quite skeptical about OSI replacing their current networks.

"GOSIP may be in the same basket as ADA," said David Snellen, president of Data Management Systems, in Washington, which provides technical support to agencies such as the Joint Chiefs of Staff. "We have to have ADA, but we still do things the normal way. We have standard equipment here, like Sun, DEC, Sequent, and VAX clusters. GOSIP doesn't add any functionality to what we already have with TCP/IP and DEC-Net."

The problem with GOSIP is that many key pieces, such as dynamic routing, are still missing. (See sidebar, Page 76.)

"The first GOSIP kicking in in August doesn't mean that OSI is here," says Internetworking's McConnell. "There's a whole lot of missing pieces. A heterogeneous environment is the only place where OSI will have any advantage over a proprietary environment."

Still, government planners believe GOSIP lays the infrastructure that will allow for increased use of standards in the future. In this way, GOSIP will offer a gradual transition to OSI protocols.

IMPACT ON COMMERCIAL USERS. Over the long haul, GOSIP may encourage vendors to develop cheap, interoperable hardware. Already, some businesses have committed to OSI as a long-term, fundamental computing strategy.

"We're not planning on having OSI as just another protocol," said Laurie Bride, manager of network architecture and standards at Boeing Computer Services. "We have too many to manage now. We're planning on OSI providing the common networking capability that we need. It doesn't preclude vendors providing value-added, provided they add it in the right place and not interfere with the interoperability that the standards offer."

For the desktop user, however, the important protocols are applications such as X Window, Postscript, and SQL, according to Frank Dzubeck, president of Communications Network Architects Inc. "There's no need for OSI on the desktop. OSI is first and foremost for the internet, between LANs and between systems," Dzubeck said.

Will GOSIP change how people do business? It will certainly change how government bid requests look. Given that it takes anywhere from 12 to 36 months for the government to select computing systems, it seems pretty certain that the GOSIP-compliant systems will start appearing in government offices within a few years.

Over time, the increase in government purchases of GOSIP-compliant systems will lead to the availability of more and cheaper products, for government and business buyers alike.

Most observers believe that it will take at least two and as many as 10 years for GOSIP's effect to be felt. All users and government officials, however, do agree that there will be an effect.

"GOSIP will have a ripple effect," said McConnell of Internetworking. "I guess we don't call it trickle down now that Reagan is gone." □

Carl Malamud is a San Francisco writer who specializes in network issues. He is currently working on a book on DEC-Net/OSI, to be published next year.

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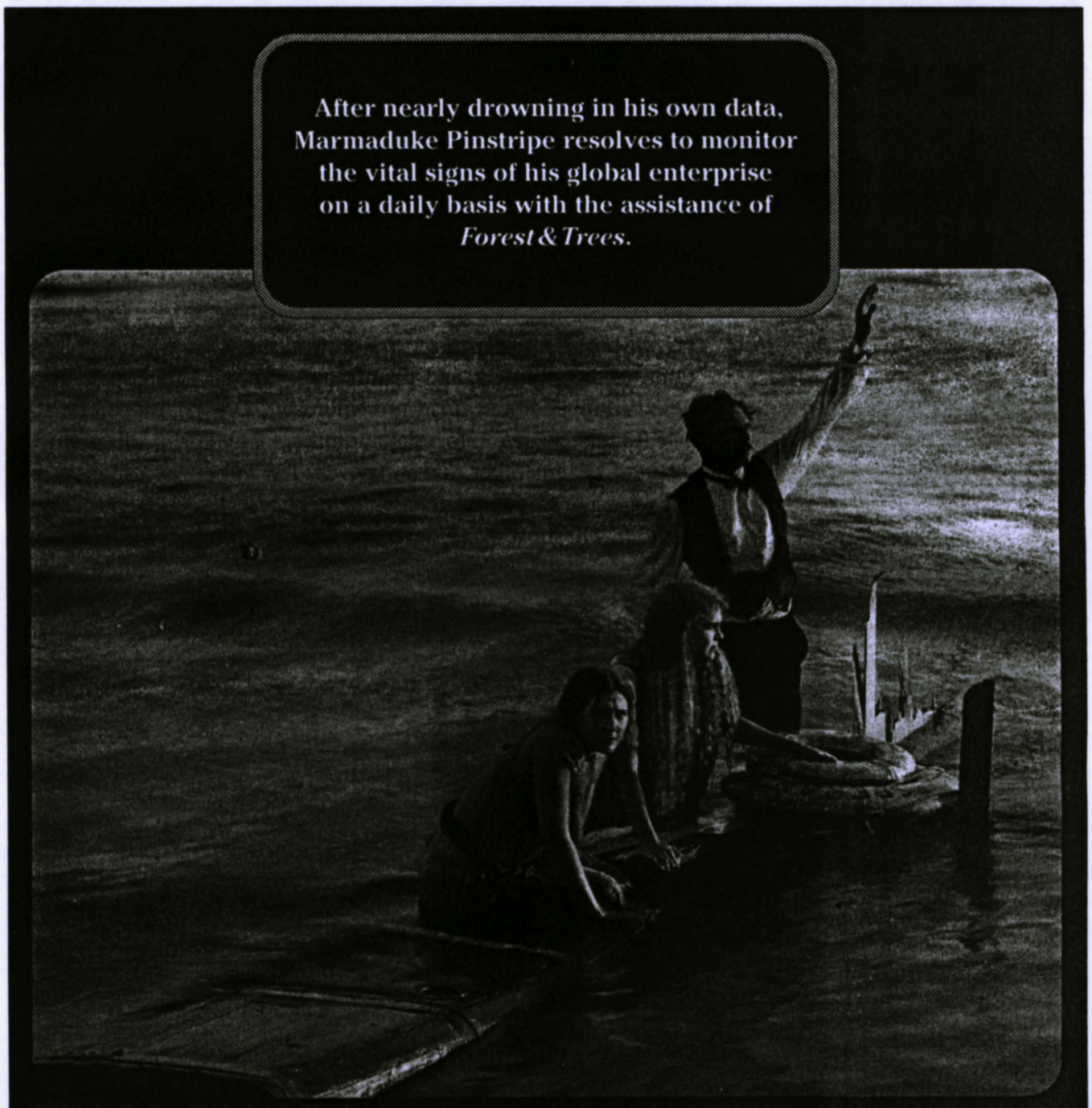
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